Minnesota Pollution Control Agency

December 14, 1984

Mr. Paul Josephson
E.A. Hickok and Associates
545 Indian Mound
Wayzata, Minnesota 55391

Dear Mr. Josephson:

Mark Simonett and I have reviewed your draft final report for work performed at the Reilly Tar site. We have a number of comments and suggestions which we would like to see incorporated into the final report.

In understanding our comments, you should first understand what we envision this report to be. It should serve as a document which succinctly summarizes the work performed at W23 and W105. The audience should be assumed to be technically oriented persons; not necessarily hydrologists, but persons capable of understanding what was done on the site and the rationale for performing a task one way instead of another. The information should be presented in a summary fashion so that the reader does not have to wade through details or continuously jump to tables of analytical results, and data can be presented as order-of-magnitude figures when appropriate to support a conclusion. Most important, the narrative must provide justification and support for significant conclusions; the reader will not necessarily accept these conclusions on faith.

We have previously communicated these same ideas to you. Reference, for instance, a letter from Mike Hansel to George Boyer dated March 21, 1983, or the discussion which took place at the meeting between you and Mark Simonett on October 19, 1984. The general comments which we provide on the draft report, and the suggested revisions thereto, are directed toward making this report a document which will at least partially meet the criteria outlined above.

In terms of scope, the draft which you submitted covers the appropriate topics (we will comment on "Recommendations" later). However, the depth of the report is inadequate because in many cases the text presents conclusions without supporting documentation. We have indicated in our comments those statements for which we feel it is important for you to provide support. Also, while we do not generally wish to make editorial comments on an author's writing style, there are many sentences which are ambiguous due to misplaced modifiers and clauses, and we have indicated where these should be corrected.

Phone._____
1935 West County Road B2, Roseville, Minnesota 55113-2785
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At the end of this document, you provide a number of recommendations. It is your privilege to make these recommendations, but please remember that in order for us to undertake a remedial action funded by the U.S. Environmental Protection Agency (EPA), it is necessary for us to first perform a feasibility study which conforms with the requirements of the National Contingency Plan (NCP) (40 CFR Part 300). Your work was not intended to analyze options for dealing with ground water contamination, and this phase of the project did not include a comparison of costs of various options as the NCP would require. Consequently, there is no basis for such recommendations as pumping W23 at maximum capacity (many hundreds of gallons per minute) without first determining the cost of reconstructing the well to the necessary size and pumping and treating the water, and then comparing the benefits of this action with the consequences of doing something less or nothing at all.

To facilitate revision of this document, we are returning the draft which you sent us with our comments and suggested changes written in the margins. If any of these comments are unclear, or if you have any questions or comments, please contact me at 296-7395 or Mark Simonett at 296-7390.

Sincerely,

Stephen D. Riner, Project Leader
Superfund Unit
Site Response Section
Solid and Hazardous Waste Division

SDR/rj

Enclosure

cc: Paul Bitter, U.S. Environmental Protection Agency - Region V

MEMORANDUM NO. SLP - W105

DATE: NOVEMBER 30, 1984

DRAFT

SUBJECT: ST. LOUIS PARK WELL ABANDONMENT
PROJECT - W 105

TO:

FROM:

THE PURPOSE OF THIS TECHNICAL MEMORANDUM IS TO SUMMARIZE THE FINDINGS OF INVESTIGATIONS PERFORMED AT W23 AND W105 SINCE THE TECHNICAL MEMORANDUM DATED FEBRUARY 1, 1983. INCLUDED IN THIS MEMORANDUM, IN ADDITION TO THE FINDINGS, ARE WATER QUALITY RESULTS AND WATER LEVELS. FIGURES HAVE BEEN PRODUCED SHOWING THE RECONSTRUCTION STATUS AT THE PRESENT TIME. CONCLUSIONS AND RECOMMENDATIONS SUMMARIZE THE WORK PERFORMED AT THE FORMER REPUBLIC CREOSOTE FACILITY.

EMCON ANALYTICS & ASSOCIATES
HYDROLOGISTS-ENGINEERS 6615 MIAH ROAD, WAYZATA, MINNESOTA 55391

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I. INTRODUCTION

On May 6, 1982, the firm of E. A. Hickok and Associates, Inc. entered into a contract with the Minnesota Pollution Control Agency to perform an investigation of two wells (W23 and W105) at the former Republic Creosote facilties in St. Louis Park, Minnesota.

The supply well (W23) for the former Republic Creosote facility was originally drilled to a deth of 909 feet. The second well (W105), referred to as the Sugar Beet well, was originally drilled to a depth of 950 feet. Both of these wells penetrate bedrock from the Platteville limestone to the Mt. Simon sandstone.

Records indicated that both of these wells were filled with debris -- W23 to a depth of 595 feet; W105 to an unknown depth. The nature of the fill in these wells was unknown except for the presence of a coal tar plug in W23. All of the information and/or description of the wells was based upon best available information (television log of the well, USGS geophysical logs of the well, and well driller's information).

A Technical Memorandum dated February 1, 1983 was prepared to summarize the findings of work performed on W23 through January 1983. This memorandum summarizes the findings of W23 since January 1983 and the findings of W105 from October 1983 through October 1984.

II. PURPOSE OF INVESTIGATION

The purpose of the investigation of W23 and W105 was to verify the geologic units and casing schedule as recorded, determine the type and extent of debris in the well, determine the existence and/or extent of contamination in the various geologic units, and development of an abandonment program so that the wells can be used as either monitoring or pump-out wells.

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III. FINDINGS

The investigative work performed at W23 and W105 has been reported in the monthly progress reports. In addition, numerous television logs, geologic logs, water quality, water level data, and photographs have been submitted to the Minnesota Pollution Control Agency.

W23

After a lengthy delay due to funding difficulties in the contract ~~amendment~~, work continued on W23 during June 1983. Debris was bailed out of the hole to the top of the bentonite seal which had been previously placed in W23 to seal the lower aquifers (Mt. Simon and Ironton-Galesville). A sample of the debris bailed from the hole was retrieved from a depth of 503 feet.

During July 1983, several attempts were made to remove the remaining 7" casing from W23. Approximately 29.6 feet of 7" casing had been removed in November 1982. Efforts were made to cut, slice, and shear the 7" casing into smaller segments. On July 29 and August 3, 1983, television logs revealed that these efforts had not been effective in cutting the 7" casing into a smaller segment.

A larger rig was used during August to extract the 7" casing from the hole. During early September, the 7" casing began moving. The protective 8" liner was removed from the hole. The 7" casing was removed from the well on September 8.

The hole was televised on September 9 to determine the extent of borehole contamination after removal of the 7" casing. An 8" liner was placed in the hole to a depth 250 feet with packers at 250 feet and 90 feet. Debris was bailed from the hole. The hole was televised again on September 27, 1983. Water samples were taken on September 28, 1983 from the Prairie du Chien-Jordan aquifer with the inflatable packer set at 280 feet. The pumping rate was approximately 22 gpm. Samples were taken at 0 and 8 hours of pumping.

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After sampling, the well was cleaned from the bottom of the hole (near 525) to the bottom of the 10" casing (245'). While bailing debris (sand) from the hole on October 11, the bailer was lost near the bottom of the hole. After several attempts to retrieve the bailer, it was decided to cease fishing for the bailer.

The hole was televised on October 25 to view the improvement in borehole contamination and view the top of the bailer. Water samples were taken on October 26, 1983 of the Prairie du Chien-Jordan aquifer with the inflatable packer at 280 feet. The pumping rate was approximately 20 gpm. Samples were taken at 0 and 8 hours of pumping. Following this sampling, W23 was demobilized.

Figure 1 indicates the condition of W23 as of October 26, 1984.

W105

On October 28, 1983, W105 was opened. The water level was measured at 9.29 feet below the top of the 12-inch casing. Debris in the well began at a depth of 10.5 feet. Clay, sand, gravel, and some rocks were removed from W105. Some metal was also removed from the well.

The well was televised on November 2 and 14 to determine the location of an 8-inch pipe in W105. The bottom of the 12" casing was observed at 62 feet.

On November 15, W105 was pumped for 8 hours with an inflatable packer between 62 and 68 feet. The pump inlet was located at approximately 80 feet to sample the Platteville aquifer. The average flow rate was 21 gpm. Water samples were taken at 0 hours, 20 minutes, and 8 hours. ~~Each~~ All of the samples were aromatic. The initial sample was gray in color; the second was cloudy; the third was clear.

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The Minnesota Geological Survey (MGS) logged W105 on November 16 to identify the drift, Platteville, Glenwood, and St. Peter formations. On November 18, 8 feet of 8" pipe were removed from the hole. Additional material bailed from the hole consisted of clay and rocks with a creosote odor.

A caliper log on November 21 revealed a 16-inch open hole between 72 and 78 feet. Drilling and bailing continued as material sluffed off the borehole into the hole. A television log of the hole on November 22 showed that the 8" pipe was lodged in the hole. The 8" pipe was removed from the hole on November 30. The pipe was deteriorated with several holes in the pipe. The exterior of the pipe was coated with black sand and gravel material with a creosote odor.

On December 1, 1983, the MGS calipered W105 to a depth of 130 feet. Portions of W105 below the 12-inch casing were greater than 12 inches. The Glenwood formation appeared to be significantly eroded, thus preventing the use of packers in this area to provide a seal preventing downhole flow. An obstruction at the base of the 12-inch casing prevented installation of the 10-inch pipe. Twelve-inch tools were used to ream the hole. Material removed from the hole was black sand and gravel with a creosote odor. Some metal was found at a depth of approximately 160 feet. At 180 feet, fist-size stones were among the material removed from the hole.

On December 29, 1983, a caliper log was run to a depth of 233 feet. Large holes were located from 150 to 185 feet. The lower portion of the hole (218-232 feet) was a nominal 12-inch hole with some debris clinging to the side walls.

A 10-inch liner was placed in W105 on January 3-4, 1984 with bentonite around a 10-inch x 12-inch packer. The packer was placed at approximately 246 feet to prevent downhole flow.

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Drilling and bailing the Prairie du Chien continued on January 9, 1984. Difficult drilling was encountered at several depths where 2 to 4-inch rocks and metal were found among clay, sand and gravel material.

On January 11, the Prairie du Chien aquifer was sampled. The results indicate the Prairie du Chien aquifer water quality is similar to the Platteville aquifer. After 8 hours of pumping, the water looked clear but had a creosote odor.

After completion of sampling the Prairie du Chien aquifer, the Jordan formation was drilled and bailed. Material bailed from the Jordan formation was similar to the material encountered in the Prairie du Chien formation.

On January 17, the Jordan formation was sampled. An inflatable packer was placed at the Prairie du Chien-Jordan contact with a pump below. The packer deflated after approximately 5 hours of pumping. Laboratory results of samples taken at 40 minutes and 5 hours indicate the Jordan aquifer is contaminated with PAH compounds at a concentration of —. The samples were aromatic. Same comment as before

An aquifer test was performed at W105 in the Prairie du Chien-Jordan aquifer on January 23, 1984. Pumping continued for 4.5 hours with water level recorders on both W105 and W23. A sample of the effluent was taken after 4 hours 20 minutes of pumping. Laboratory results indicate the groundwater is contaminated with PAH compounds at a concentration of — (units). Discharge rate? What did they show?

Work was suspended at W105 on January 27, 1984 pending contract negotiations and approvals to amend the contract. After a lengthy delay, work resumed at W105 on July 23, 1984.

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The hole was bailed from a depth of 435 feet on July 23 to 780 feet on August 1. Hard drilling was encountered below 747 feet. Evidence indicates that some metal object is located in the hole below this depth.

The hole was televised on August 2 by MDH. Several holes were noticed in the formation between 260 and 320 feet. The side walls were not visible below 465 feet due to suspended material in the well bore. A gamma log ~~was~~ performed on W105 to 752 feet show~~ing~~ed good agreement to previous logs on W23.

A second attempt to televise the hole on August 7 proved inconclusive. In conjunction with the MPCA, it was decided to use compressed air jetting air to clean W105 from the bottom of the 10" casing to the bottom of the hole. Cleaning began at 300 feet on August 10; ending on August 13 at a depth of approximately 560 feet. Sandy material which had sluffed sl. sloughed into the hole during cleaning was removed from the hole. Debris removed from the hole included white sand with an oily sheen, 1 to 3-inch rocks (some formation, others were granite), and sand.

On August 20, the lower portion of the hole (760-580 feet) and the segment from 300 to 260 feet was cleaned. Debris which had sluffed sl. into the hole during this cleaning was removed on August 21.

On August 22, the bailer became lodged in the hole at a depth of 780 feet. After several attempts to retrieve the bailer, including televising the hole on August 29, the bailer was abandoned in the hole. The well was reconstructed as an Ironton-Galesville well.

A caliper log of W105 was performed on August 31. The most significant erosion (i.e., aggregate greater than 1 inch diameter) of the formations has occurred in the Platteville, St. Peter, and Prairie du Chien aquifers. The lower portions of the hole are slightly eroded.

Bentonite was used to seal the bottom of W105 to a depth of 754 feet covering the abandoned bailer. Cement grout was placed in the hole to a depth of 703 feet.

Buckshot was placed in the hole to the top of Ironton-Galesville formation to protect this formation during removal of the 10-inch casing and cleaning of the St. Peter Aquifer. On September 10, the 10-inch casing was removed from W105.

The St. Peter aquifer was cleaned with air jetting. Contaminants were noted in the water and removed from W105 during this cleaning operation. Debris, including metal and bricks which had fallen into the bottom of the hole during cleaning, was bailed out of the hole.

On September 14, the 6-inch liner was installed in W105. The liner was grouted from the bottom (650 feet) to the surface.

The buckshot which had been placed in W105 to protect the Ironton-Galesville was removed from the hole. The buckshot contained some oily contaminant.

On September 24, the Ironton-Galesville formation was cleaned with air jetting. The discharge from this cleaning was noticeably cleaner than ~~what~~ which had been observed during the St. Peter aquifer cleaning.

On September 25, the Ironton-Galesville formation at W105 was sampled after seven hours of pumping at approximately 100 gpm. The sample was clear with little or no detectable odor. Laboratory analytical results indicate the water quality is similar to that of samples taken from other formations in W105.

Figure 2 indicates the condition upon completion of renovation at W105.

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IV. WATER QUALITY

The analytical laboratory results of groundwater sampled during 1982 are contained in the Technical Memorandum dated February 1, 1983. These analyses include samples from August 5, 6, and 7, September 13 and 17, October 18, 19, and November 4 and 5, 1982.

Analytical laboratory results from October 28, December 7, December 14, 1982, September 28, October 26, November 15, 1983, January 11, 17, 25, and September 25, 1984 are included in Tables 1 through 4. Column 1 on Table 1 indicates the water quality during cleaning of the Ironton-Galesville at W23. Column 2 indicates the water quality during efforts to pull the 7-inch casing after a portion of both the 7-inch and 10-inch casings had been removed from W23. Column 3, Table 1 indicates the water quality of the Platteville formation after the upper portion of the 10-inch casing had been removed exposing the Platteville formation.

Table 2 shows the change in water quality before and after cleaning of the Prairie du Chien-Jordan aquifer at W23.

Table 3 shows the water quality of the Platteville formation of W105.

Table 4 indicates the water quality of the Prairie du Chien and Jordan aquifers at W105. The Prairie du Chien formation water quality is shown in columns 1 and 2. The water quality of the Jordan sandstone is shown in columns 3 and 4. Column 5 indicates the water quality of the combined Prairie du Chien-Jordan aquifer sampled during the January 25, 1984 aquifer test. In addition, Table 4 indicates the water quality of the Ironton-Galesville at the conclusion of renovation of W105.

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Table 5 summarizes the water quality of all samples taken at W23 and W105. Six of the 29 parameters have been identified as carcinogens or possible carcinogens by the U.S. EPA in "The Carcinogen Assessment Group's List of Carcinogens," July 14, 1980. These include benz[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[a]pyrene, indeno[1,2,3,cd]pyrene, and dibenz[a,h]anthracene. The sum of these six parameters is included in Table 5.

Also shown in Table 5 for comparative purposes is the sum of the 29 parameters which were analyzed for each sample. If a value was less than the detection limit, it was regarded as zero for summation purposes.

W23

All efforts to determine the water quality of the Mt. Simon aquifer indicate that it is contaminated with PAH compounds. The water quality indicated by the September 17, 1982 sample shows the highest degree of contamination when the packer had a good seal eliminating down-hole flow.

The analytical results of the Franconia-Ironton-Galesville at W23 do not show a significant improvement in water quality after cleaning the aquifer.

One sample was taken on October 28, 1982 of contaminated water during cleaning at W23. Another sample of water was taken on December 7, 1982 during efforts to remove the 7-inch casing. In both cases, some of the highest concentrations of contaminants were observed flowing from W23 during these operations. This indicates the presence of PAH contamination behind the 10-inch casing at W23.

Flowing due to what?

Why? more explanation needed.

The Platteville formation is contaminated by PAH compounds at W23, as indicated by the December 14, 1982 sample.

A substantial improvement in the water quality of the Prairie du Chien-Jordan aquifer is indicated by samples of September 28 and October 26, 1983. The aquifer was cleaned between these two sampling events. The concentration of each of the six carcinogens was less than the detection limit of 1 ug/l after cleaning.

W105

The water quality of the Platteville aquifer is indicated by the analytical results of samples taken on November 15, 1983. After 8 hours of pumping, the concentration of each of the six carcinogenic compounds was less than 1 ug/l. A significant improvement in water quality was observed following 20 minutes of pumping, indicating that a large ~~degree~~ amount of contaminant was present in the borehole. Continued pumping only slightly improved the water quality, indicating the water quality of the Platteville aquifer at W105 is ? Indicating what?

The water quality of the Prairie du Chien-Jordan aquifer is indicated by samples taken on January 11, 17, and 25, 1984. Generally, these samples indicate an improvement in water quality with continued pumping and approximately the same degree of contamination as was observed in the Platteville aquifer.

After completion of renovation of W105 as an Ironton-Galesville well, a sample was taken after 7 hours of pumping at a rate of approximately 100 gpm. This sample shows a poorer water quality in the Ironton-Galesville ~~compared to~~ than in other formations at W105.

Each aquifer sampled in both W23 and W105 ~~were~~ was shown to be contaminated with PAH compounds.

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V. WATER LEVELS

Table 6 summarizes water levels measured at W23 and W105 from July to October 1984. Measurements through January 1984 have been reported to the Minnesota Pollution Control Agency.

There was close agreement between W23 and W105 water levels when both were open to the Prairie du Chien-Jordan aquifer.

Water level measurements in the annular space of W105 indicate that the water level of the Platteville aquifer is approximately 80 feet higher than that of the Prairie du Chien-Jordan aquifer.

After final reconstruction of W105, the piezometric head of the Ironton-Galesville aquifer is approximately 40 feet lower than that of the Prairie du Chien-Jordan aquifer.

VI. CONCLUSIONS

The following are conclusions of the investigation of W23 and W105 at the former Republic Creosote facilities in St. Louis Park.

1. Debris had been placed (indicates willfulness. "was found" is more accurate) in W23, including creosote.

2. Water samples indicate the Platteville, Prairie du Chien, Jordan, Ironton-Galesville, and Mt. Simon aquifers are contaminated with PAH compounds in the vicinity of W23.

3. The 10-inch casing in W23 is in poor condition with likely contamination between it and the borehole.

4. Debris had been placed (was found) in W105, including material tainted with PAH compounds.

(does this indicate the material was tainted before it entered the well? If so, how do you know?)

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5. Water samples indicate the Platteville, Prairie du Chien, Jordan, and Ironton-Galesville aquifers are contaminated with PAH compounds in the vicinity of W105.

VII. RECOMMENDATIONS

The following items are recommended to solve the groundwater contamination observed at the former Republic Creosote facilities in St. Louis Park.

1. Renovation of W23 should be completed, including removal of the 10-inch casing and cleaning of the remainder of the borehole. The well should be developed as a Prairie du Chien-Jordan pump-out well. A variance should be requested to install an 8-inch liner to allow for maximum discharge capacity from W23. 300 gpm isn't enough?

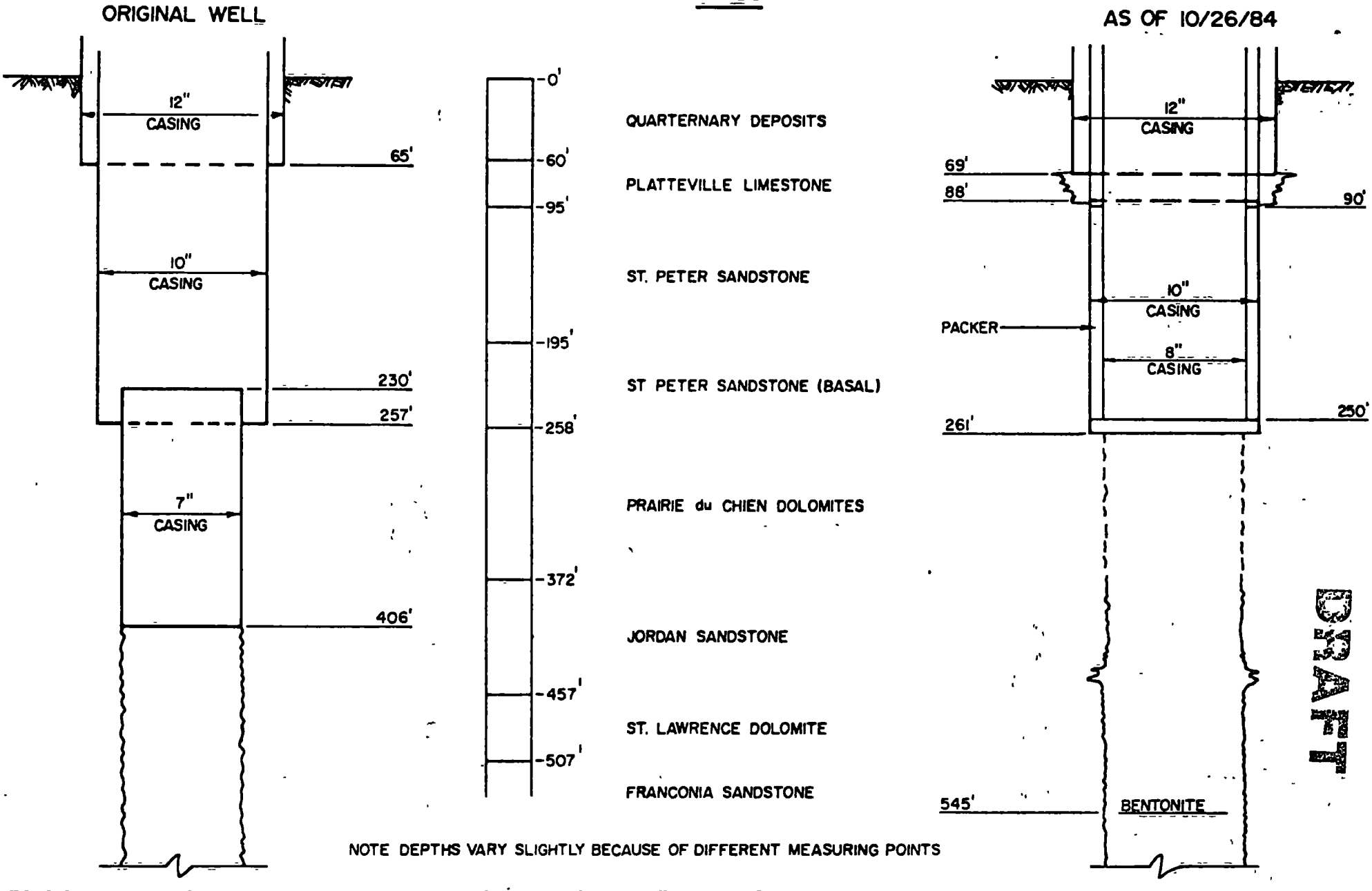
2. Well W23 should be pumped ~~at its maximum capacity~~ to contain and capture contaminated groundwater near the site in the Prairie du Chien-Jordan aquifer. The pumping should continue until the remedial plan outlined in the "Study of Groundwater Contamination in St. Louis Park, Minnesota," November 1981, is implemented. → This statement does not include cost-benefit analysis which is necessary to make this conclusion.

3. Well W105 should be pumped as detailed in the "Study of Groundwater Contamination in St. Louis Park, Minnesota," November 1981, to contain and capture contaminated groundwter near the site in the Ironton-Galesville aquifer.

4. The effluent from these two pump-out wells should be treated on-site and discharged. how? where? Why not discharge to sanitary sewer w/o treatment?

5. Periodic sampling should be undertaken to monitor the groundwater quality in the Prairie du Chien-Jordan and Ironton-Galesville aquifers. where?

W23



NOTE DEPTHS VARY SLIGHTLY BECAUSE OF DIFFERENT MEASURING POINTS

MINNESOTA POLLUTION CONTROL AGENCY	E.A. HICKOK & ASSOCIATES HYDROLOGISTS - ENGINEERS MINNEAPOLIS - MINNESOTA	NOV., 1984
ST. LOUIS PARK WELL 23 RECONSTRUCTION		1

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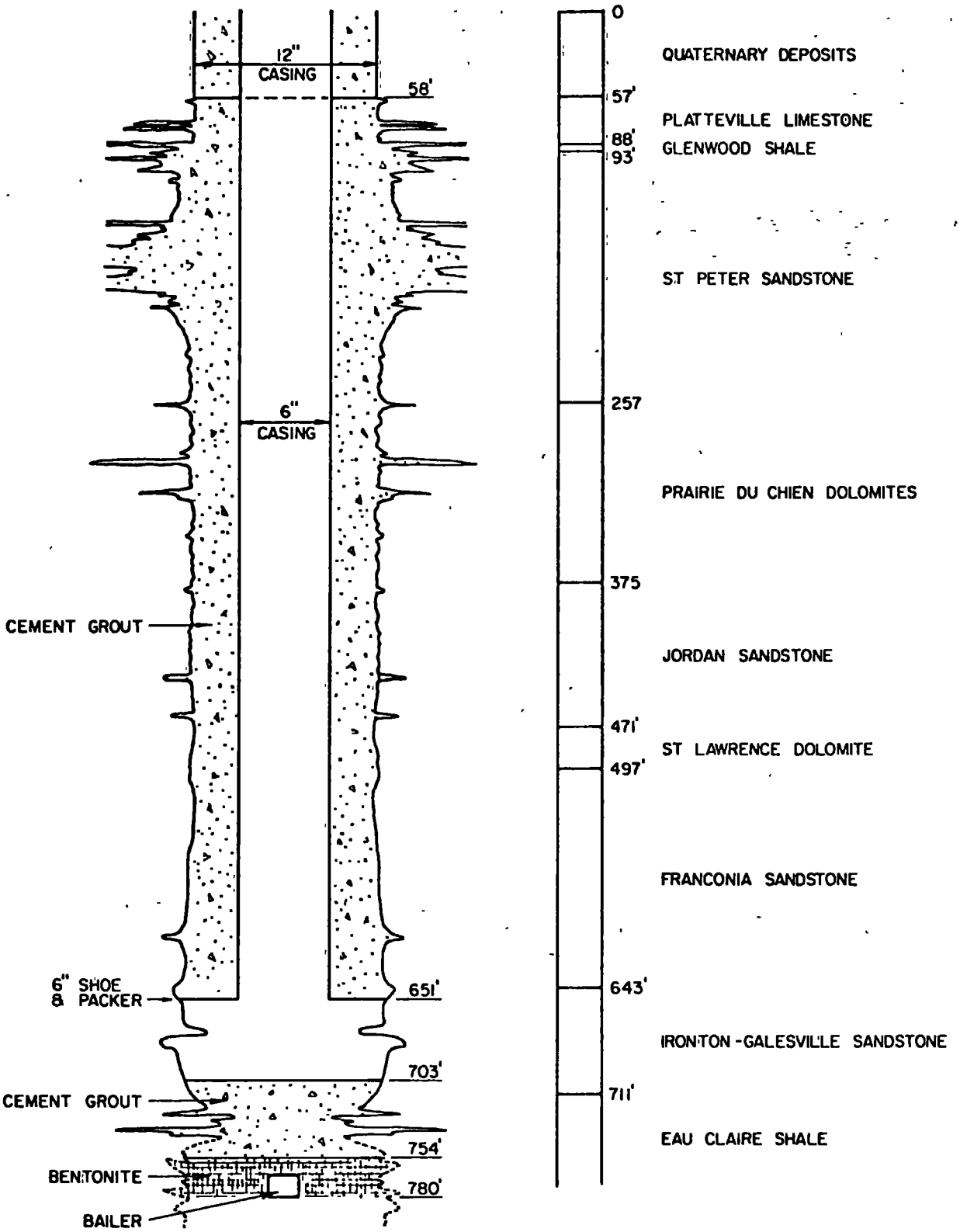
WI05
AS OF 9/25/84



MINNESOTA POLLUTION CONTROL AGENCY	E.A. HICKOK & ASSOCIATES	NOV, 1984
ST. LOUIS PARK WI05 RECONSTRUCTION	HYDROLOGISTS-ENGINEERS MINNEAPOLIS-MINNESOTA	2

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TABLE 1

WATER QUALITY DATA
ST. LOUIS PARK - W23

Date	10/28/82	12/7/82	12/14/82
Hour	0	0	1
Formation	10" Casing	12" Casing	Platteville
Packer	--	--	None
Inlet Depth, feet	Surface	Surface	72.5
Flow Rate, gpm	290	--	20
Compound	Concentration, ug/l		
2,3-dihydroindene	220	330	160
Indene	280	610	310
Naphthalene	2,600	4,400	1,000
Benzo(b)thiophene	160	270	100
Quinoline	<20	<10	<10
2-Methylnaphthalene	2,500	2,400	580
Indole	<20	<10	<10
1-Methylnaphthalene	1,600	1,600	480
1,1-Biphenyl	450	500	120
Acenaphthylene	200	330	82
Acenaphthene	1,600	1,400	390
Fluorene	1,700	1,600	400
Phenanthrene	4,000	3,600	930
Anthracene	900	600	150
Acridine	100	75	22
Phenanthridine	30	12	5
Carbazole	230	180	93
Fluoranthene	1,500	1,600	410
Pyrene	1,300	1,200	330
Benz[a]anthracene	400	180	53
Chrysene	530	130	32
Benzo[b]fluoranthene	400	30	26
Benzo[k]fluoranthene	330	43	26
Benzo[e]pyrene	280	21	12
Benzo[a]pyrene	470	30	18
Perylene	70	3	2
Indeno[1,2,3 cd]pyrene	190	<10	12
Dibenz[a,h]anthracene	210	<10	14
Benzo[g,h,i]perylene	260	<10	4
Carcinogen Total	2,200	370	155
Total of 29 Compounds	22,510	21,144	5,761

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TABLE 2

WATER QUALITY DATA
ST. LOUIS PARK - W23

Date	9/28/83	9/28/83	10/26/83	10/26/83
Hour	0:15	8	0:30	8
Formation	Prairie du Chien-Jordan	Prairie du Chien-Jordan	Prairie du Chien-Jordan	Prairie du Chien-Jordan
Packer	Good at 280'	Good at 280'	Good at 280'	Good at 280'
Inlet Depth, feet	362	362	362	362
Flow Rate, gpm	22	22	20	20

Compound	Concentration, ug/l			
2,3-dihydroindene	1,600	1,370	78	57
Indene	14,700	786	145	106
Naphthalene	82	2	335	338
Benzo(b)thiophene	324	130	43	35
Quinoline	<1	11	4	2
2-Methylnaphthalene	1,230	310	74	43
Indole	<1	<1	<1	<1
1-Methylnaphthalene	1,970	910	145	106
1,1-Biphenyl	760	480	19	20
Acenaphthylene	<1	290	24	22
Acenaphthene	860	970	99	81
Fluorene	1,530	720	76	64
Phenanthrene	1,300	640	86	61
Anthracene	340	110	13	9
Acridine	63	33	4	3
Phenanthridine	6	<1	<1	<1
Carbazole	810	470	32	20
Fluoranthene	600	110	18	10
Pyrene	500	73	12	7
Benz[a]anthracene	170	5	<1	<1
Chrysene	200	6	<1	<1
Benzo[b]fluoranthene	100	2	<1	<1
Benzo[k]fluoranthene	80	1	<1	<1
Benzo[e]pyrene	72	1	<1	<1
Benzo[a]pyrene	120	2	<1	<1
Perylene	21	<1	<1	<1
Indeno[1,2,3 cd]pyrene	12	<1	<1	<1
Dibenz[a,h]anthracene	52	<1	<1	<1
Benzo[g,h,i]perylene	<1	<1	<1	<1
Carcinogen Total	654	15	<1	<1
Total of 29 Compounds	27,502	7,432	1,222	1,002

TABLE 3

WATER QUALITY DATA
ST. LOUIS PARK - W23

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Date	11/15/83	11/15/83	11/15/83
Hour	0:00	0:20	8:00
Formation	Platteville	Platteville	Platteville
Packer	Good (62-68')	Good (62-68')	Good (62-68')
Inlet Depth, feet	80	80	80
Flow Rate, gpm	21	21	21

Compound	Concentration, ug/l		
2,3-dihydroindene	62	29	16
Indene	100	56	136
Naphthalene	1,084	175	29
Benzo(b)thiophene	43	15	10
Quinoline	<1	<1	<1
2-Methylnaphthalene	84	15	9
Indole	26	4	<1
1-Methylnaphthalene	89	24	13
1,1-Biphenyl	10	4	2
Acenaphthylene	11	7	9
Acenaphthene	68	17	6
Fluorene	41	11	5
Phenanthrene	47	16	5
Anthracene	11	2	<1
Acridine	4	1	<1
Phenanthridine	<1	<1	<1
Carbazole	30	8	7
Fluoranthene	17	3	<1
Pyrene	14	2	<1
Benz[a]anthracene	2	<1	<1
Chrysene	16	<1	<1
Benzo[b]fluoranthene	22	2	<1
Benzo[k]fluoranthene	4	<1	<1
Benzo[e]pyrene	3	<1	<1
Benzo[a]pyrene	3	<1	<1
Perylene	2	<1	<1
Indeno[1,2,3 cd]pyrene	7	<1	<1
Dibenz[a,h]anthracene	<1	<1	<1
Benzo[g,h,i]perylene	<1	<1	<1
Carcinogen Total	50	2	<1
Total of 29 Compounds	1,800	391	247

TABLE 4

WATER QUALITY DATA
ST. LOUIS PARK - W105

Date	1/11/84	1/11/84	1/17/84	1/17/84	1/25/84	9/25/84
Hour	0:45	8:00	0:40	5:00	4:20	7:00
Formation	Prairie du Chien	Prairie du Chien	Jordan	Jordan	Prairie du Chien-Jordan	Ironton-Galesville
Packer	--	--	Good (370')	Leaky (370')	--	--
Inlet Depth, feet	--	--	410	410	194	180
Flow Rate, gpm	38	38	15	15	235	100
Compound	Concentration, ug/l					
2,3-dihydroindene	26.7	17.4	2	7	11.0	17.
Indene	21.1	15.7	<1	5	9.3	34.
Naphthalene	27.9	98.6	1.7	13	17.1	350.
Benzo(b)thiophene	7.5	15.6	<1	4	4.2	18.
Quinoline	<1	<1	<1	<1	<1	<0.5
2-Methylnaphthalene	43.1	38.4	4	5	16.8	86.
Indole	<1	<1	<1	<1	<1	<1.25
1-Methylnaphthalene	51.0	38.0	9	14	19.2	53.
1,1-Biphenyl	<1	18.1	3	5	10.5	11.
Acenaphthylene	4.8	7.6	2	4	5.8	16.
Acenaphthene	52.7	46.4	32	12	38.4	27.
Fluorene	41.3	40.1	36	13	33.7	26.
Phenanthrene	69.6	11.4	117	12	67.4	35.
Anthracene	12.7	11.4	82	4	11.9	11.
Acridine	2.2	4.2	<1	<1	2.2	1.4
Phenanthridine	<1	1.8	<1	<1	<1	<1.25
Carbazole	14.1	7.7	8	4	4.7	9.0
Fluoranthene	19.0	10.0	102	10	29.0	7.6
Pyrene	16.2	7.8	94	8	27.2	5.5
Benz[a]anthracene	2.9	<1	32	3	4.6	0.8
Chrysene	2.8	<1	63	3	7.5	1.0
Benzo[b]fluoranthene	<1	<1	39	2	2.3	<0.5
Benzo[k]fluoranthene	<1	<1	18	<1	2.4	<0.5
Benzo[e]pyrene	1.0	<1	13	<1	2.0	<0.5
Benzo[a]pyrene	1.2	<1	16	1	2.2	<0.5
Perylene	<1	2.7	3	<1	<1	<1.25
Indeno[1,2,3 cd]pyrene	<1	<1	5	<1	2.3	<1.25
Dibenz[a,h]anthracene	<1	<1	3	<1	<1	<1.25
Benzo[g,h,i]perylene	<1	<1	16	<1	<1	<1.25
Carcinogen Total	6.9	<1	158	9	18.9	1.8
Total of 29 Compounds	417.8	392.9	700.7	129	331.7	709.3

DRAFT

TABLE 5

SUMMARY OF WATER QUALITY

Date	Sample No.	Concentration, ug/l Carcinogen Total	Concentration, ug/l Sum of 29 Components
8/05/82	OW23-Pond-0	0	0
8/05/82	OW23-100'-9:10	625	3,489
8/05/82	OW23-FS-0	55	569
8/06/82	OW23-EC-0	91	672
8/06/82	OW23-MS-0	8,375	41,359
8/06/82	OW23-MS-8	15	380
8/07/82	OW23-MS-16	0	176
8/07/82	OW23-MS-24	2	303
9/13/82	OW23-MS-0	2,731	12,849
9/13/82	OW23-MS-0:30	1,903	10,131
9/13/82	OW23-MS-1:00	56.1	338.4
9/13/82	OW23-MS-2:00	30.7	183.6
9/13/82	OW23-MS-4:00	12.1	88.7
9/17/82	OW23-MS-4:30	5,220	27,602
10/18/82	OW23-FIG-0	49	667
10/19/82	OW23-FIG-24	8	270
10/28/82	OW23-10" CASING-0	2,200	22,510
11/04/82	OW23-FIG-0	64	915
11/05/82	OW23-FIG-22	3	1,187
12/07/82	OW23-12" CASING-0	370	21,144
12/14/82	OW23-PV-1	155	5,761
9/28/83	OW23-PCJ-0	654	27,502
9/28/83	OW23-PCJ-8	15	7,432
10/26/83	OW23-PCJ-0	<1	1,222
10/26/83	OW23-PCJ-8	<1	1,002
11/15/83	W105-PVL-0	50	1,800
11/15/83	W105-PVL-0:20	2	391
11/15/83	W105-PVL-8	<1	247
1/11/84	W105-PDC-0:45	6.9	417.8
1/11/84	W105-PDC-8	<1	392.9
1/17/84	W105-JDN-0:40	158	700.7
1/17/84	W105-JDN-5	9	129
1/25/84	W105-PCJ-4:20	18.9	331.7
9/25/84	W105-IGL-7	1.8	709.3

TABLE 6

ST. LOUIS PARK

WATER LEVELS - JULY TO OCTOBER 1984

DRAFT

Date	--- W-23 --- Prairie du Chien-Jordan	---------- W-105 ---------- Prairie du Chien-Jordan	Platteville
July 23	798.17	798.55	883.79
July 24	799.23	799.11	
July 25	799.05	797.94	
July 26	798.17	Prairie du Chien to Ironton-Galesville	
July 27		798.38	
July 30	796.32	795.30	
July 31	793.99	793.00	
August 2	794.22	795.57	
August 9	800.99		
August 10	800.15		884.19
August 31	801.44	801.95	884.08
		St. Peter to Ironton-Galesville	
September 13	811.69	865.6	
		St. Peter to Franconia	
September 14	813.52	866.5	
		Ironton-Galesville	
		885.9 (with pea rock)	
September 21	805.32	775.20	
September 25		795.61	
September 27		775.48	
October 26	818.25	778.14	

Minnesota Pollution Control Agency

October 14, 1981

Mr. Paul Bitter
U.S. Environmental Protectin Agency
111 West Jackson
Chicago, Illinois 60604

Dear Mr. Bitter:

Enclosed is a copy of the draft report prepared by E. A. Hickok and Associates. The document is priviledged and therefore should not be released or its contents freely discussed. Please review the report and send your comments to me or Mike Convery of the Minnesota Department of Health by October 19. A tentative meeting to discuss the comments with Hickok has been scheduled for October 26. The final report is due on November 30, 1981.

Please contact me at (612) 297-2726 or Mike Convery at (612) 296-5297 if you have any questions.

Sincerely,

Richard R Ferguson

Richard R. Ferguson
Regulatory Compliance Section
Solid and Hazardous Waste Division

RRF/dc
Enclosure

Phone: _____
1935 West County Road B2, Roseville, Minnesota 55113
Regional Offices · Duluth/Brainerd/Detroit Lakes/Marshall/Rochester

ϵ_{ms}

$\left(\frac{\epsilon_{ec}}{\epsilon_{ms}}\right)_{ROD}$

850 0 — ← gray shale slurry
2
4
6 ← same as above
8 gray sandy material
860 0 — ← gray slurry, sandy
2 ← Rod says were in Mt. Simon @ 863.5 (photo)
4
6 ← shale turned back
8 ← bailer stuck
870 0 —
2
4
6
8
880 0 —
2
4
6
8
890 0 —
2
4
6
8
900 0 —
2
4
6
8
910 0 —
2
4
6
8
920 0 —

bailer stuck in hole

@ 861 Rod says drill pressure suggests sand

[bottom of bailer stuck at 865']

(sample of reddish brown shale

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ϵ_{ec}

700 0 2 4 6 8 ← creosote with some shale
710 0 2 4 6 8 ← bottom of drill bit shiny
720 0 2 ← creosote and sand
4 after hammering on metal, metal came out as powder
6 8
730 0 2 4 6 8 } no record of material
740 0 2 4 6 8
cavern
750 0 2 4 6 8
760 0 2 4 6 8 } drill bit dropped through this section
770 0 2 4 6 8
780 0 2 4 6 } bit gets hung up
8
790 0 2 4 6 8 } area probably shale with some creosote (greenish-gray shale) (bailer hung up)
800 0 2 4 6 8 } shale, watery some creosote
810 0 2 4 ← bailer gets stuck (photo)
6 ← greenish gray shale on bottom of bit ← bailer gets stuck at 815'
8
820 0 ← broke tool, taper tap used for retrieval
2 ↘ shale fragments, trace sand, some contaminant
4 ←
6 ← same as above
8 ← same as above
830 0 ← same as above
2 ← same as above
4 ←
6
8
840 0 ← gray shale on bottom of bit } traces of sand, white
2 ← same as above
4
6
8
850 0 ← gray shale slurry

bailer stuck in hole

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550 —

bottom

560 — coal tar

570 — ← coal tar sample

580 — ← coal tar

590 — contained stringy material - photo by Jim Nye

← one small rock, little sand, rope (photo)

← harder, core breaks, black

7" liner

600 — ← stuck in barrel, heat to retrieve black, soft coal tar, few rocks little sand

← black, coal tar, crumbly, little grit, little rock

← black soft coal tar, few fibers, gritty

← same

← same 607.5" barrel hung up

610 — ← hard creosote, black dry (photo) (sampled using whirlpac bags)

← black creosote, medium hard

← black soft creosote (photo of creosote @ 613.5) (pea sized piece of sandstone)

← black hard dry creosote

← back, soft creosote (photo of Rod operating rig,

620 — ← medium grained, sand with creosot

← same

← same

← same

← sand black hard with creosote (photo)

630 — ← fine to med grained sand with creosote (photo)

← sand with black creosote

← pure black soft ceosote

← coal tar with some sand

640 — ← sand with creosote

← medium grained sand with creosote

← split spoon and shoe lost in hole, Rod says he hit metal, perhaps a pump

← sand with little creosote

650 — ← sand with creosote

← fine to med grained sand with creosote

← creosote with sand

← gravel, sand, creosote mixed - asphalt like (sample piece of metal from barrel)

← same (photo)

660 — soft black creosote

670 —

← same

680 — ← same (photo)

(health concerns discussed with Rod and Paul)

690 — ← same rigged up new bailer

formation contact

← creosote with some gravel

← creosote with some sand (sample shale and metal, perhaps from bailer damaged earlier) photo

bailer shoe latch lost @ 695 - reddish brown clay, or shale, white sand - clean rocks, (sample - nut, photo)

700 — ← reddish brown shale, sample

Legend

creosote or coal tar

rock

sand

← sample (preserved?)

shale